

III. *The Method of making Tin-Plates, extracted from the Memoirs of the Academy of Sciences, for the Year 1725, by William Rutty, M. D. R. S. Secr.*

THE making of Tin-plates, or Lattin, as it is called, being not commonly practised in *England*, though there is so great a Consumption of it, either because the Method is not sufficiently known, or because that in Use to make small Quantities for particular Purposes is much too dear to answer the Artificer's Expectation in making larger, whereby we are obliged to export our own Tin to *Germany*, to receive it back again *manufactured*, I thought it not improper to lay before the Society the Method the *Germans* themselves make use of, as I have extracted it from a Dissertation of Mr. *De Reaumur*, printed in the last Volume of the Memoirs of the Academy of Sciences of *Paris*, in which also he lays down some Improvements, as he thinks, of his own.

He takes notice then that the making of Tin-plates, (which is called in *France*, *white Iron*) does not properly begin, till they go about to prepare the Leaves or Plates of Iron that are to be tinned, which are supposed to be sufficiently thin and flat, and cut into Squares: But there are only certain Sorts of Iron which can be reduced into these Leaves, of which those are the most proper, that when heated are easiest extendible, and yet can be forged with a Hammer when cold; the more soft and extremely flexible, as well

well as the more brittle being to be rejected. These Leaves are drawn from Bars of Iron, about an Inch square ; which being made a little flat, they cut into thin Pieces or Soles (*semelles*) which they fold together, and having made them into Parcels containing forty Leaves each, beat them all at once with a Hammer that weighs from 600 to 700 lb. Weight. After this, the principal Part of the whole Art is to prepare these Leaves ; for the lightest Dust, or the least Rust upon their Surface will prevent the Tin from uniting with them. This may indeed be taken off by filing, but that being much too expensive, the same may be brought about by steeping the Plates in acid Waters, for a certain Time, to what Number they please, and when they are taken out, scouring them with Sand, in order to fetch off any Thing that may remain upon the Surface : And by this Method a Woman may clean more Plates in an Hour, than the most expeditious Workman can file in many Days. Of these Waters the Author mentions several ; but what the *Germans* themselves used, and which they make a mighty Secret of, he found to be only common Water made eager with Rye, which requires very little Pains. For after they have ground the Grain grossly, and pounded it, they leave it to ferment in common Water for a certain Time, and with a little Patience they are sure to have an eager Menstruum. With this Menstruum they fill Troughs or Tuns, into which they put Piles of Iron Plates ; and to make it grow eager the better, and to have more Activity, they keep these Vessels in Vaults or Stoves which have little Air, and in which they keep lighted Charcoal. The Workmen go into these Vaults once or twice in a Day, either to turn the Plates

Plates that they may be equally exposed to the Action of the acid Liquor, or to take out those that are sufficiently cleansed, or to put others in their room: And as the Liquor is more acid, or the Heat of the Vault or Stove is more intense, the Plates are sooner cleansed; but it requires at least two Days, and sometimes a great deal more. This is the Method which the *Germans* employed in the Tin-works in *France*, constantly made use of to prepare the Iron-plates to receive the Coat of Tin: But as the Author observed, that the constant Attendance upon them in the Stoves was very laborious, the Heat therein being almost insupportable to those who are not used to it, he proposes some other Methods which are attended with very little Trouble, and as small, if not a less Expence; and which upon Trial succeeded full as well. Having therefore observed that the Iron-leaves or Plates are covered with a Scale or Layer, half vitrified by the Fire, on which Acids have none or very little Effect, he imagined that instead of *dissolving* the Iron in these acid Waters, it would be better to make it *rust*, and thereby put it in a Condition to be easier cleansed from these Scales; as Rust is accompanied with a sort of Fermentation and Rarefaction, and the Matter which rusts takes up a greater Space, and raises up whatever opposes it. To this Purpose he steeped Iron Plates in different eager Menstruums, as in Water in which Alum, common Salt and Sal-armoniack were separately dissolved; and others of the same Iron he only dipped into the same Waters, and instantly taking them out exposed them to the Air. These latter were rusted by all of them, but sooner by that in which the Sal-armoniack was dissolved. After two Days, during which every Plate had been dipped

ped into the Menstruum but twice or thrice, he scour'd them, and likewise those he had left to steep for that Time; and comparing them together, found that those, which had been only wetted at different Times, cleansed better than those which were steeped; the Rust covering all the Surface of the latter without rais-ing the Scale; whereas in the former, as soon as one Part of the Metal is detached, it is attracted by the Menstruum, and the Surface is raised into Blisters of Rust. These Dissolvents, the Author takes notice, tho' weak in themselves, yet produce the Effect as well as the stronger, which are much dearer: But amongst the latter he prefers Vinegar, which being very plen-tiful in *France*, may be used with little Cost. For you need only dip each Leaf into it, and take it out again immediately, leaving it afterwards in some moist Place, and it will be scaled in eight and forty Hours, if you take care to repeat this 3 or 4 Times in a Day. The scaling will still be more expeditious, if you dis-solve a little Sal-armoniack in the Vinegar, a Pound or two to a Puncheon; for as the Vinegar dissolves I-ron well, so Sal-armoniack, as just observed, rusts it sooner than any other Salt: But this must be used very moderately, and the Leaf must be left to steep in clean Water to disolve any Particles of it that may stick to its Surface, which may otherwise make it rust after it is tinned. If you scale with Vinegar, and want to do it at a less Expence, you need only plunge the Leaves once or twice at farthest, and when the Vinegar is dri-ed upon the Surface, sprinkle it with Water; or dip them into it, and take them out immediately. There are several other Ways of making Iron rust, as keeping it in a moist Cellar, exposing it to the Dew, sprinkling

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it with simple Water, several Times in a Day, which will still act quicker by dissolving Sal-armoniack in it. In those Countries where the Pyrites is common, the Vitriolick Waters will scale them soon enough, which are almost as cheap as common Water: You need only heap the Pyrites together, and leaving them to moulder in the Air, make afterwards a Lixivium with them and common Water, which Lie will have the desired Effect: But as the Leaves of Iron are sensibly much easier cleaned on one Side than the other, the bad Side rarely taking the brilliant Polish in the tinning, but having always some Spots, which proceeds in that in the beating one Side is more exposed to the Action of the Hammer, and is therefore better plained, the Author again advises not to steep them, but only to moisten them, in order to make them rust, whereby you need moisten that Side only that wants it most: Whereas if you steep them, as the bad Side will take double or triple the Time of the other, the acid Menstruum will dissolve the Surface, and occasion a Loss of Iron. He next gives two Cautions necessary to be followed: the first is in the Management of the Plates before they come to be prepared; which is in the beating of them, to change the Place of each in its Turn, that every one may receive the immediate Action of the Hammer, otherwise they will not extend equally: the second is to steep them in Clay or Fuller's earth tempered with Water before you heat them, to prevent their soldering with one another. He then closes this Part of the Operation with remarking that whatsoever of these Methods are pitched upon, whether the old one, of which he has learnt the Secret, or any of the new, which he has here shewn, it is absolutely necessary after the Plates

are sufficiently scaled, to scour them with Sand, and when there remains no more black Spots upon their Surface, to throw them into Water to prevent their rusting again, and leave them in it till the instant you would tin them, or in the Term of Art, blanch them. This he observes is the very Object of the whole Art, and is kept as much a Secret by the *Blancher*, as the acid eroding Menstruum is by the *Scaler*: But the Manner of doing it is thus. They flux the Tin in a large iron Crucible, which has the Figure of a broken Pyramid with four Faces, of which the two opposite ones are less than the two others. This Crucible they heat only from below, its upper Border being luted in the Furnace quite round. The Crucible is always deeper than the Plates which are to be tinned are long, which they always put in downright, and the Tin ought to swim over them. For this Purpose Artificers of different Trades prepare the Plates in different Manners, which are all exceptionable: But the *Germans* he perceived made use of no Preparation whatsoever, except putting the scoured Plates into clean Water, as just remarked; but when the Tin is melted in the Crucible, they cover it with a Layer of a Sort of Suet, an Inch or two thick, through which the Plate must pass before it comes to the Tin: The first Use of which is to keep the Tin from burning, and if any Part should take Fire, as the Suet will soon moisten it, to reduce it to its natural State again. This Suet is compounded, as the *Blanchers* say, and is of a black Colour, which the Author thought might be given it with Soot or the Smoak of a Chimney, only to spread a Mystery over their Work: but he found it true so far, that common unprepared Suet was not sufficient: For after several Attempts, there

was always something wanting to render the Success of the Operation certain. The whole Secret then of Blanching lies entirely in the Preparation of this Suet : And this he at last discovered to consist only in first frying and burning it ; which not only gives it the Colour, but puts it into a Condition to give the Iron a Disposition to be tinned, which it does surprisingly. The Tin itself ought to have a certain Degree of Heat ; for if it is not hot enough it will not stick to the Iron ; if it is too hot, it will cover it with too thin a Coat, and the Plates will have several Colours, as a Mixture of red, blue, and yellow, and the whole appear of a villainous yellow Cast. To prevent this, by knowing when the Tin has a proper Degree of Heat, they might first make an Essay with small Pieces of the scaled Plates, and they would learn from them when the Tin is in proper Order: But generally speaking, they dip the Plates into Tin that is more or less hot, according to the Thickness they would have the Coat to be of. Some Plates they only give one Layer to, and these they plunge into Tin, that has a lesser Degree of Heat than that into which they plunge those Plates which they would have take two Layers ; as also when they give these the second Layer, they put them into Tin that has not so great a Degree of Heat, as that into which they were put the first Time : Besides which, it is to be observed, that the Tin, which is to give the second Coat, ought to be fresh covered with Suet, but only with the common Sort without Preparation ; for melted Tin is sufficiently disposed to attach it self to solid Tin ; and in this Case it is to tin itself, to which the new Tin is to be joined. As to the Choice of the Tin, the Manner of making it is as bright as possible, with a Number

ber of little Articles necessary to the Practice, the Author refers them to another Time, as more properly belonging to the Description of the whole Art, than to a Memoir in which he only gives the Principles of it.

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IV. *A Letter from the Reverend Mr. James Bradley Savilian Professor of Astronomy at Oxford, and F.R.S. to Dr. Edmond Halley Astronom. Reg. &c. giving an Account of a new discovered Motion of the Fix'd Stars.*

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YOU having been pleased to express your Satisfaction with what I had an Opportunity sometime ago, of telling you in Conversation, concerning some Observations, that were making by our late worthy and ingenious Friend, the honourable *Samuel Molyneux* Esquire, and which have since been continued and repeated by my self, in order to determine the *Parallax* of the *fixt Stars*; I shall now beg leave to lay before you a more particular Account of them.

Before I proceed to give you the History of the Observations themselves, it may be proper to let you know, that they were at first begun in hopes of verifying and confirming those, that Dr. *Hook* formerly communicated to the publick, which seemed to be attended with Circumstances that promised greater Exactness in them, than could be expected in any other, that had been made and published on the same Account. And as his Attempt was what principally gave Rife to this, so his Method in making the Observations was in some Mea-